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First Impressions.

By PROFESSOR J. J. R. MACLEOD
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I have just been reminded that I promised, before leaving Toronto, to send for publication in the Medical Journal, a few of my impressions on returning to old Scotland after sojourning for a quarter of a century in the new countries across the Atlantic. I forgot whether the impressions are intended to relate to what I have left or to what I have come to. I will choose the latter and, in the first place, let me say that I have been impressed both with "newness" and the "oldness" of things here. Of course I am speaking of University life, particularly that within the faculties of medicine and science. When compared with what existed when I was an undergraduate, there have been striking advances: new laboratories, splendidly built and furnished, with enlarged staffs, and in most cases, adequate funds, but often the schedules for instruction are but little changed from what they were thirty years ago. This is particularly so in the medical sciences. Curious anomalies exist, for example Botany continues to be required as a course for the medical degree; Biochemistry and Histology are still considered as parts of Philosophy, whereas, on the other hand, Embryology is attached to Anatomy. Chemistry and Physics are required for entrance, but courses are held during the first year in Medical Chemistry and Medical Physics. This appears to be in many ways a good arrangement, although it encounters the danger that too much emphasis may come to be placed on what appear to be the applications of these basic sciences, and too little on the broad principles upon which future developments may depend. During the first year, therefore, the student must take courses in Medical Chemistry and Physics, in Zoology and in Botany at the same time he is studying Human Anatomy. He goes up for his first professional examination in the former group of subjects at the end of the year and he cannot enter the second year classes until he has passed these examinations. During the second year, Anatomy and Physiology occupy most of the time and the second professional examination is taken at its close. The third year is devoted to Systematic Medicine, Pathology, Materia Medica (and Pharmacology) and Forensic Medicine, and work is started in the Medical Clinic, each student being given charge of one or more cases which he is required to report upon during the ward walks. Surgery is not started until the fourth year, and along with Clinical Medicine, Obstetrics and Gynecology and the specialties, it occupies also the fifth year.

So much for the course of study, and now it may be of interest to say something of the students and their activities. In the first place, there is no Hart House and consequently but little opportunity for social intercourse outside the class hours. All students who come from the country, perhaps about one-half of the whole, live in 'digs' scattered all over the city. There are

no dormitories or fraternities, and a student may be in attendance at the University for several weeks before he comes to know any of his class-fellows. Athletics are given considerable attention, and every Wednesday afternoon classes are suspended so that football and hockey, during winter, and cricket and tennis, during summer, may be taken part in, military drill, gymnasium work and swimming filling in for those not interested in the major sports. Student societies of one kind and another are quite numerous, and the Medical Society seems to be a lively organization. This meets once a week and I am told that many interesting and instructive discussions on medical and surgical subjects are held during the year. Naturally, the students taking the most active part in the work of this Society are those of the later years, but in its place during the earlier ones, is the Anatomical and Anthropological Society, conducted entirely by the students, in which dissections are demonstrated and papers are given on various subjects bearing on structure and function.

This may all seem to be very serious, all work and no play, but the latter is by no means neglected. About once every month there is a University dance held in the Mitchell Hall, this being one of the most beautiful University halls anywhere (I would almost say with the exception of the great hall at Hart House). The dances are conducted under University auspices and the cost is very moderate. Each class also holds an annual dinner and students joining the O.T.C., which is very popular, have numerous other little functions which are well patronized. There are, no doubt, other student activities of which I have not so far heard, but I can see on the whole, student life is quieter than in Toronto, with fewer outside diversions and consequently,—but in this I may be wrong—more time is spent in study.

The administration of the University is interesting. The students elect the Lord Rector, who holds office for three years. His duties being largely nominal—the only serious one being to deliver a public address—this dignitary is usually some prominent statesman, except in St. Andrew's, where some famous author or explorer fills the post. The Rectorial elections are great events in Scottish student life. They are held during the first few weeks of the winter session and for weeks before, campaigning by the various parties holds the attention of all. This year, for example, in the Rectorial elections in Glasgow, there were four candidates—Mr. Stanley Baldwin, a unionist, Mr. Samuel, a liberal, Mr. Roslyn Mitchell, a socialist, and Cunninghame Graham, a Scottish nationalist. Mr. Baldwin was elected, but only by a narrow majority, over the nationalist, who appeared to capture the female vote. The result was a most surprising one, for there are really relatively few people in Scotland who desire Home Rule for Scotland, this, of course, being the chief plank in the nationalist platform. It is said that the socialists practically all voted for Graham, who is also of this party. But from the students' point of view, the Rectorial election is chiefly an occasion for 'cutting up,' as one would say in Canada, but the less said about what happens the better! To win the election is no sinecure, for the Rectorial address is an ordeal—even Lloyd George found it so in Edinburgh—and after its delivery the torchlight procession through the city is an event remembered in every student's life. But rough and tumble though many of these functions may be, there is no objectionable rowdyism about them, no destruction of property and no vulgarity. Besides the Lord Rector is the Chancellor, also largely a nominal dignitary, his duties being delegated to the Vice-Chancellor, who is also Principal, corresponding to the President at Toronto. He presides over the University Court, a body somewhat like that of the Board of Governors, having to do with the material welfare of the University, and the Senate,

which is entrusted with the control of its purely academic functions. The various faculties are constituted much the same as in Toronto. Finally, the students have a Representative Council to which each class elects members annually. This Council, now in existence for many years, performs several useful functions, regulating the various social activities of the University, advising the Senate in matters of student discipline, managing the publication of the weekly journal—Alma Mater—and so forth.

In many ways all British Universities are alike. I can see but little difference between Toronto and Aberdeen. The one is new and big, the other old and of moderate size, but otherwise there is little to distinguish between them. When the time came in September for the return to Toronto of some of my old colleagues, who visited the old country during last summer, I felt out of it in not being one of them, and I almost wished that the ties of the old land had not pulled so strongly as to tear me away from the sunshine and newness of Canada to the greyness and antiquity of this silver city by the sea. But I am consoled by having with me as a constant reminder of my very happy associations with the students of Toronto a cane, which bears the inscription, "Presented by the Medical Society of Toronto," and which has already done me lusty service in some of my ramblings along the banks o' Dee.

Some Important Points in the Anatomy of the Glossopharyngeal Nerve.

By ERIC A. LINELL, M.D.

Historical.

The Glossopharyngeal or Ninth cranial nerve has presented difficulties to anatomist from the earliest times principally because the Ninth, Tenth and Eleventh nerves, on account of their close relationship at the brain-stem, have tended to be grouped together as one nerve. Centuries of work on the Cranial Nerves was required before the glossopharyngeal was finally described as a separate anatomical entity by Meckel in 1817. In 1822 a German anatomist, Kilian, raised this nerve from its state of low repute among its fellows, by devoting an entire book to it. This work is largely a historical account of observations on the cranial nerves in general and on the glossopharyngeal in particular. He quotes the opinions of fifty-five anatomists from Galen (A.D. 130) to John Frederick Meckel (1817), and only to the last named can he give the credit of describing a "true and very completely undistorted picture" of the glossopharyngeal nerve. Kilian prefaces his book with a quotation from Seneca: "Those who lived before us did much, but they did not do all. A thousand ages after our day opportunity for adding to knowledge will exist." As proof of the wisdom of these words it is interesting to note that another century passed after the publication of Kilian's book before a disease of, and one confined to, the glossopharyngeal nerve was first described and thus finally established the practical importance of the anatomical study of the nerve.

Anatomy.

The glossopharyngeal is a mixed nerve containing motor, secretory and sensory fibres. It arises from the highest part of the dorso-lateral groove of the medulla oblongata between the olivary body ventrally and the restiform body dorsally. It runs laterally to the jugular foramen, through which it leaves the skull in company with, but

on an anterior plane to the tenth and eleventh nerves. Immediately after its passage through the jugular foramen the nerve is enlarged by the presence of its two sensory ganglia; the smaller, superior or jugular ganglion and the larger ganglion inferius or petrous ganglion. One important branch arises from the latter ganglion, the tympanic nerve. This small filament enters the petrous portion of the temporal bone and is distributed in a plexiform manner to the mucous membrane of the inner wall of the middle-ear cavity. From the anterior end of this plexus certain of its fibres become united to form a small nerve, which joins the small superficial petrosal nerve and eventually reaches the otic ganglion. Here its fibres end by synapsis with the nerve-cells of the ganglion. The axones of these ganglion-cells are finally distributed to the parotid salivary gland through the auriculo-temporal nerve.

The nerve trunk below its sensory ganglia takes a course downwards and forwards in the neck. It hooks round the posterior border of the stylopharyngeus muscle to get its lateral aspect, giving this muscle its nerve of supply en route, and passes forwards to disappear under the posterior border of the hyoglossus muscle, where its terminal branches are distributed to the mucous membrane of the base of the tongue and the epiglottis.

During its course through the neck the nerve gives off two pharyngeal branches, one piercing the superior constrictor muscle to reach the mucous membrane of the nasopharynx and the other uniting with the pharyngeal branch of the vagus nerve to form the pharyngeal plexus. By means of its tonsillitic branches the glossopharyngeal supplies the mucous membrane of the tonsillar region, the supratonsillar fossa, and the soft palate.

Motor Distribution.

The motor fibres of the Glossopharyngeal nerve are the axones of cells situated in the upper part of the nucleus ambiguus which lies under the floor of the fourth ventricle and contains the motor cells of the ninth, tenth and eleventh nerves. It is probable that all the motor fibres of the ninth nerve are used up in the supply of the stylopharygeus muscle.

Placed just above the upper extremity of the nucleus ambiguus is a collection of nerve-cells designated as the inferior salivatory nucleus. The axones of these cells enter the Glossopharyngeal nerve and are distributed, through its tympanic branch, to the parotid gland by a circuitous route, which has already been briefly sketched. These are the secretory nerve-fibres to the gland.

Sensory Distribution.

The larger, sensory portion of the glossopharyngeal nerve has its nerve cells in the two ganglia placed on the course of the nerve immediately below the jugular foramen. The central processes of these sensory cells enter the medulla and end by synapsis round certain cells of the nucleus solitarius, which is the combined central sensory nucleus of the ninth and tenth nerves.

The peripheral processes of the sensory cells are distributed to and therefore bring back sensory impulses from the mucous membrane covering an area including the whole of the nasopharynx; the lumen of the eustachian tube, the free margin of the arch on the anterior surface and the whole of the posterior surface of the soft palate, uvula, tonsil and supratonsillar fossa, anterior and posterior pillars of the tonsillar fossa, base of the tongue stretching forward as far as the line of the circumvallate papillae and, lastly, the anterior and perhaps the posterior surface of the epiglottis. In addition to this extensive area the tympanic branch of the nerve transmits sensory impressions from the mucous membrane of the middle-ear cavity including the inner surface of the tympanic membrane and the lumen of the eustachian tube at its outer, or middle-ear, end, By means of a small communicat-

ing filament with the auricular branch of the vagus nerve, the glossopharyngeal is also believed to contribute a part of the supply to the skin of the groove between the posterior surface of the auricle and the mastoid process. (Ramsay Hunt).

As well as supplying the fibres of general sensibility to the areas above noted, the glossopharyngeal nerve carries the sensation of taste from those taste-buds situated in the posterior third of the tongue and in the epiglottis.

The area of the sensory supply of the nerve, as described above, is the total area of distribution of the glossopharyngeal nerve and is overlapped to some extent by the distribution of the fifth nerve above and the tenth nerve below.

Practical Considerations.

The stylopharyngeus muscle is inserted in part to the lateral wall of the pharynx immediately lateral to the tonsil and it has been suggested that a strongly acting muscle may pull the tonsil laterally and account for the depth of the tonsillar fossa in certain cases.

The glossopharyngeal nerve provides the afferent limb of the reflex arc concerned in the 'tonsillar cough,' which is often a prominent symptom of disease of the tonsil.

As this nerve supplies the posterior surface of the epiglottis and the base of the tongue with sensory fibres, it has been called the "sentinel of the larynx." It provides the afferent limb for the reflex closure of the glottis during deglutition.

Probably the commonest disease affecting the glossopharyngeal nerve is bulbar paralysis. This condition results from destruction of the nerve-nuclei lying under the floor of the fourth ventricle and, in view of the close anatomical association of parts, glossopharyngeal paralysis is complicated in these cases by paralysis of the tenth and twelfth nerves. In the symptomatological picture which these patients present there is room, therefore, for considerable confusion as to the amount of the total picture for which each nerve is individually responsible. It is of interest to note that certain sufferers from bulbar paralysis die of suffocation from the ingestion of food into the larynx and that others die of septic bronchopneumonia, probably caused by the passage into the lungs of small food particles. Both these causes of death signify inefficient reflex closure of the glottis during deglutition and paralysis of the glossopharyngeal is the responsible agent.

Herpes in the distribution of the ninth nerve has been noted by several observers. Ramsay Hunt saw the eruption in the skin-cleft between the pinna and the mastoid (1910), Orbison in 1908 had a case of herpes of the tympanic membrane which he attributed to zosteroid affection of the petrous ganglion of the nerve, and Neve, in 1919, observed an eruption over the left half of the soft palate with pain below and behind the left ear.

Glossopharyngeal Neuralgia.

This disease was first described in 1920 by two Frenchmen. Sicard and Robineau, and since that date over twenty cases have been reported in the literature. The importance of this disease from the anatomical point of view is that it is a neuralgia affecting the complete distribution of, and limited to, the glossopharyngeal nerve. It is considered to be a disease of the sensory ganglia of the nerve and its symptomatology is on all fours with that of trigeminal neuralgia.

Stookey writing in 1928 says "the attacks are paroxysmal, with sudden severe pain beginning in the throat, at the base of the tongue and in the region of the tonsil, radiating to the area in front of the ear and, in some instances, down the neck. Pain occurs spontaneously, but is brought on by swallowing, eating or by touching the base of the tongue or the tonsillar region. It is

described as sharp, stabbing and stinging. The attacks are associated with a feeling of dryness of the mouth on the same side as the pain."

The type of the attack and the character of the pain is so similar to that experienced in trigeminal neuralgia that, in several instances, surgical treatment has been erroneously directed to the trigeminal nerve. The position of the pain should, however, point the way clearly to the glossopharyngeal. The treatment of this condition is similar to that for trigeminal neuralgia, namely, section of the glossopharyngeal nerve between its attachment to the medulla oblongata and its exit from the cranial cavity. This operation has been performed now in a considerable number of cases with radical cure of the disease.

Observations of great value with reference to the distribution of the glossopharyngeal nerve can be gleaned from a careful examination of patients who have had the nerve cut for the relief of the disease. The results of such an examination have been reported in three cases, two by Dandy in 1927, and one by Stookey (1928), and, for the most part, these have been incorporated in the description of the nerve given above.

Stookey suggests that the glossopharyngeal may supply to some extent the palatopharyngeus and palatoglossus muscles, as he observed in his case a certain amount of sagging of the arch of the palate on the paralyzed side. There is, however, no sign of paralysis of the superior constrictor and the motor mechanism of deglutition is perfectly performed. The dryness of the mouth on the paralyzed side is of interest as indicating paralysis of secretion from the parotid gland. No anaesthesia of the skin could be found in the area affected by herpes in Hunt's observation.

Tuberculosis of the Hip.

By R. I. HARRIS, M.B.,

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Etiology.

Tuberculosis of the hip is a manifestation of tuberculosis common in children as well as, to a lesser extent, in adults. This form of the disease is haematogenous in origin. The blood stream is infected from some pre-existing focus, the usual sequence of events being: primary infection in the lung, secondary mediastinal lymphadenitis, followed by invasion of the blood stream by way of the thoracic duct. The primary focus often is inconspicuous and difficult to detect. Nevertheless, the occurrence of tuberculosis in the hip joint predicates at least one other pre-existing focus which must be sought for and treated as well as the more evident one in the hip.

Pathology.

In its early stages the lesion is primarily a disease of bone. It commences in the epiphysis of the head of the femur. The remarkable constancy with which the disease locates in this particular spot constitutes an unsolved problem in the disease. The earliest lesion is the familiar microscopic tubercle which characterizes the disease in whatever tissue it may occur. Surrounding the tubercle is a zone of inflammatory reaction. As the disease extends the structure of the bone is destroyed and replaced by tuberculous granulation tissue. The calcified intercellular substance is absorbed by a process of rarifying osteitis. The osteoblasts multiply. The whole of the diseased area be-

comes transformed into a cellular and vascular tissue containing little or no calcium and filled with tubercles. This destructive tuberculous inflammation of bone is called caries, a descriptive term which antedates our knowledge of the bacterial nature of the disease.

As the epiphysis is situated completely within the capsule of the hip joint it is not long before the joint itself is invaded by tubercle bacilli. When this occurs, the whole interior of the joint becomes involved in a tuberculous inflammatory reaction, the articular cartilage is rapidly destroyed, and the joint cavity becomes filled with tuberculous pus. As the disease progresses the capsule is eroded and the contents of the joint cavity invade the muscle planes to form a tuberculous abscess. If treatment is instituted early this may absorb spontaneously. More commonly it finds its way to the skin and ruptures through it. The tuberculous sinus which thus forms remains open for many months before healing takes place.

Healing of the tuberculous disease in the hip occurs as the slow increase in the patient's resistance permits him to stamp out the tubercle bacilli. Healing is accompanied by the laying down of new bone and fibrous tissue. During the course of the disease, so much destruction of joint structure takes place that restoration of function after healing is almost unheard of. The usual result is cure of the tuberculous focus accompanied by fibrous or bony ankylosis.

Symptoms.

In addition to the general evidences that the body is invaded by tubercle bacilli (positive tuberculin skin test and the demonstration of a primary focus) the symptoms and signs of hip joint disease may be summarized as follows:

1. Pain—Local or Referred.
2. Muscle Spasm—Night cries.
3. Limitation of movement.
4. Deformity.
5. Limp.
6. Atrophy.
7. Abscess.
8. X-Ray findings—
   Caries..
   Loss of articular cartilage.
   Osteoporosis.

The presence of the subacute inflammation within the joint causes pain upon movement. This pain may be located in the neighborhood of the diseased joint but frequently is referred to the knee. Often the only pain complained of is in the knee. In the early stages, the degree of pain is not great. The child may make no complaint of it. It is evidenced more conspicuously by the reflex muscle spasm which it sets up in all the muscles controlling the hip joint. This spasm is particularly evident in the adductors and is most easily demonstrated here. As a result of the muscle spasm all movements of the joint are restricted, the degree of limitation of movement depending upon the severity of the disease.

The presence of muscle spasm gives rise to a peculiar and characteristic symptom. During sleep it subsides, and when this occurs, movement of the joint is no longer guarded. Gravity shifts the limb. The accompanying movement of the joint, being painful, induces a sudden and powerful reflex which again sets the muscles into spasm and fixes the inflammed joint surfaces firmly together. The whole procedure is extremely painful, so that the child wakens with a scream. These "night cries" are very characteristic of the active stage of the disease.

The position of fixation resulting from muscle spasm is usually one of adduction and flexion. The fixed adduction gives rise to apparent shortening. To this is added later a greater or less degree of real shortening resulting from destruction of the head of the femur and of the acetabulum. These deformities as well as the limitation of movement cause the patient to walk with a limp.

Measurement of the limb reveals the real and apparent shortening and in addition a marked diminution in the

circumference of the thigh and calf. This is due to atrophy of the soft tissues from disuse.

The radiographic findings in a fully established case are characteristic. The caries is evidenced by spotty rarefaction in the head of the femur. The approximation of the head of the femur to the bony structure of the acetabulum indicates the loss of articular cartilage. In addition, the whole of the shaft of the femur, though not the actual seat of the disease, is altered in structure so that it casts a less dense shadow—Osteoporosis. This is analogous to the atrophy of the soft tissues.

Treatment.

The principles of treatment are simple; though the actual management of a case is tedious. Only two therapeutic agents are of value in the cure of this disease They are rest and heliotherapy. To obtain rest the patient must be put to bed and the joint fixed by means of a splint or a plaster spica. Extension by weights and pulleys increases the rest and overcomes the muscle spasm. The state of local and general rest so established must be maintained for a long period of time—not less than eighteen months, and longer if there are any signs of activity in the joint. During this period the patient should be exposed to sunshine. The action of the sun upon the skin is of great value, though the manner of its curative action is entirely unknown. Should an abscess appear during the period of treatment it should be left alone in the hope that spontaneous absorption will take place. If it continues to increase in size in spite of treatment directed towards the hip joint, aspiration may turn the scale. If it still increases in size, it may be opened surgically or allowed to rupture spontaneously. If opened surgically, this should be done through a small wound. Whether surgical or spontaneous drainage is permitted to occur the wound must be dressed antiseptically (not aseptically) with the most scrupulous care. Secondary infection in a tuberculosis sinus is a complication of great seriousness, since it cannot be cured and leads finally to amyloid disease and death of the patient.

Lymphatic Block.

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In the laboratories of the Committee on Medical Research in the University of Toronto considerable research was carried out on the subject of lymphatic block between June, 1924, and January, 1927, and some of the findings will form the subject of this presentation, for they give one food for thought and may also serve to stimulate further research along similar lines.

The term lymphatic block is used to designate blocking the lymphatic flow experimentally by means of ligations, in order to examine the effects produced on the tissues drained by those lymphatics, and in view of the extraordinary powers the lymphatic system has of quickly forming a collateral flow, either by the opening up of new channels or through newly-formed adhesions or other means, one may grasp the difficulty encountered in maintaining for any extended period a condition of lymphostasis. The experimentation entailed endless repetition and much minute examination of tissues.

To the casual observer lymphatic block means a damming back of the lymphatic fluid within the tissues, and he takes for granted that that fluid is the same as the fluid emerging from the thoracic duct. To the initiated it means

a whole lot more for the lymphatic flow at its source is different from that at its termination. Various organs and tissues each drain their quota of lymph into the main streams and numerous lymph glands exert their functions so that finally emerges the finished product from the thoracic duct. The true functions of the lymphatic glands have yet to be revealed and one can glean very little in the literature regarding the composition of lymph contained in the first lymphatic vessels in the different parts of the body.

A tremendous handicap is thus encountered at the outset.

In the experimentation a unit of the lymphatic system was chosen which would furnish an accessible part of the first lymphatic channels leading from the tissues drained up to the first set of lymphatic glands. The dog's mesentery furnished this unit. There one sees the lymph channels following, more or less uniformly, the blood vessels and draining a visible area of small intestine. These channels are easily traced up to the first gland. Particularly is this the case when food is present in the small intestine and chyle is being absorbed. Moreover, the intestinal mucous membrane is one of the most active and prolific of tissues and here one would expect to view the maximum of evidence of tissue actively in the lymph drained.

By aspirating with a syringe and fine needle some flowing lymph from these first lmmphatic vessels, it was found that during activity of the intestine there were a great many more cells within the lymph examined than one ever finds in thorocic duct fluid. These cells varied so greatly in size and staining that no satisfactory classification was attempted, and the only conclusion I have been able to reach is that they are cells in various stages of development. Whether they develop into tissue cells or blood cells could not be determined. At once the question arose as to the fate of these cells after they reach the lymph glands in the normal flow. Someone more skilled in laboratory technique will have to answer that question. I conjecture that these cells are potential tissue builders.

The experimentation consisted in exposing one of the first lymph glands at the root of the mesentery to which the chosen lymph channels drained. The gland was ligated around its middle point with narrow tape, and the abdomen closed. At varying intervals the abdomen was opened and the tissues examined. One always found acute inflammation of the area involved in the block. Litigations were repeated when there was evidence of collateral flow and these were placed according to the requirements of conditions found.

Extensive, hard adhesions, and bunching up of the tissues made subsequent ligations difficult. The omentum, at times, had to be partially removed, for it provided rapid collateral flow. On several occasions, chyle was found flowing up through it.

Let us now follow what happens when those cells, which were found to be so numerous in the mesenteric lymph channels, are dammed back by lymphatic block. They first collect in extended order under the submucosa, then massed formation occurs here and there in the submucosa forming collections like lymph nodes. The epithelial layer becomes pushed into the lumen over them. Further collections occur forming masses five or six deep within the submucosa. The epithelial layer is pushed away into the lumen and breaks. Then epithelial cords grow down into these cell masses and at times one wonders if the epithelium is simply proliferating or new epithelium is being formed from these cell masses, the cells of which appear to be developing epithelial likeness. Cell masses are seen separating the underlying muscle coats and spreading into the mesentery, and the final picture is a more or less complete disruption of the normal anatomy of the small intestinal wall which is thickened, hardened and generally disorganized. On examining the tissues during its various stages one is struck

by the similarity which they present to that which one sees in the tissues in the path of an oncoming cancer. One sees the same collection of cells which disrupt the tissues around a cancerous area seeming to break the ground for the onward march of the cancerous epithelium.

A critic may say that in ordinary inflammatory conditions of the bowel somewhat similar changes occur in the tissues, but to a lesser degree. That is true and it is also true that in ordinary inflammatory conditions lymphatic block occurs, but is not maintained for any extended period. Should, however, an inflammatory process such as a duodenal ulcer produce a prolonged lymphatic block for an extended period of time the tissue changes which are above outlined do occur and hence the growing opinion that cancer comes upon an old chronic inflammatory lesion.

That lymphatic block may eventually produce cancer is the main lead which has come out of this experimental work and it opens up a wide field of possibilities.

Mr. Sampson Handley, who has done so much work on the lymphatic system, had an occasion to look over some of the work and is entirely in accord with the theory. He mentioned, as a gross clinical example, the frequent occurrence of cancerous areas in Elephantiasis.

Bearing in mind those cells which appear to be the product of tissue activity and which normally seem to be cared for in the glandular system, one can visualize many possibilities when blocking, such as occurs in Elephantiasis, leaves those cells stranded in the tissues. If they are tissue forming cells one can readily understand the overgrowth of the affected part; and if we assume that a small percentage of these cells are epithelial in origin, their overgrowth may be precursory to the cancerous areas found.

Such a theory, transgressing as it does the accepted theories of cell activity in the belief that before we can get to the root of the causation of cancer some former theories must be upset, would form a good starting point for further research.

Diseases of the Kidney.

By C. B. WELD, M.A., 2T9.

The functions of the kidneys are to eliminate certain waste products from the body, to retain the blood volume, and to maintain the proper salt content in the blood. The more critically these functions are examined, the more complicated they seem, and the more complex the physiology of the kidney becomes. Many classes of compounds are to be eliminated, some require much water in order to keep them in solution, some have to be combined with a base before being excreted, and yet water and base are necessary to the body tissues and must not be wasted. The intake is very variable and so the kidneys must be very flexible in their activities. At the same time the kidney cells are living cells and must maintain themselves in health.

It is not surprising, then, that the general body conditions may greatly affect the functional ability of the kidneys, even if no actual kidney disease is present. Urinary disturbances are not synonymous with kidney disease. A few examples will make this clear.

An abnormal frequency of micturition, it is true, is often a symptom of a kidney disorder, but is much more often due to some disease of the lower urinary tract.

An excessive urinary output (Polyuria) may be a symptom of some such kidney disease as chronic nephritis, but it may also be due to an abnormal intake of fluids, or it may be a manifestation of a nervous disturbance such as hysteria. In Diabetes Insipidus there is a marked polyuria, but there is a correspondingly increased intake.

The excretion of urine may be abnormally diminished (Oliguria), or even absent (Anuria). This may be due to nervousness, or to heart failure with a low blood pressure and a passive congestion of the kidney. Lastly, it may be a sign of kidney disease, or of blockage of the lower urinary tract.

Pus and blood when found in the Urine (Pyuria and Haematuria) may be a sign of kidney disease. Disease of the lower urinary tract must be ruled out, however, and sometimes no cause at all can be found.

Albumin when found in urine makes one suspect kidney disease. It, however, is often found in the urine of apparently normal people from time to time, people who never do develope other signs of kidney trouble.

Sugar, if found in abnormal quantities in the urine, makes one think of diabetes, which is not a kidney disease. There is, however, kidney disorder known as Renal Diabetes, in which this occurs, in which no other sign of kidney disturbance can be found.

These examples serve the purpose of showing how general body conditions may affect kidney function. Conversely, disease of kidney with disturbance of function may greatly affect general body conditions. It is wonderful, however, how much kidney may at times be destroyed without greatly disturbing its function.

It is proposed in this paper to list the more important kidney diseases in a classification, and then to discuss these individually. As the list is long, it is inevitable that the discussion on any one disease must be very brief. Only the high spots can be touched, but it is hoped that by so doing, some unified picture of each disease can be presented.

Classification of Kidney Diseases.

1. *Congenital Anomalies.*
   Of size, shape, number, position, etc.
2. *Movable and Floating Kidney.*
3. *Renal Calculi.*
4. *Hydronephrosis.*
5. *Suppurative Kidney Lesions.*
   (a) Pyelitis.
   (b) Pyelonephritis.
   (c) Pyonephrosis.
   (d) Perinephritis.
6. *Tuberculosis.*
7. *Tumors and Cysts.*
   (a) Sarcoma.
   (b) Carcinoma.
   (c) Hypernephroma.
   (d) Embryomata.
   (e) Papillomata.
   (f) Polycystic kidneys.
   (g) Other cystic conditions.
8. *Non Suppurative Kidney Lesions.*
   (a) Nephritis.
   (b) Nephrosis.
   (c) Arteriosclerotic contracted kidney.
   (d) Amyloid.

In diagnosing the individual conditions, the complete picture of the case, including the history, and including special examinations, must be considered. Some of the most important items are:

1. Local.
   (a) Pain in back and loin.
   (b) Tenderness of kidney.
   (c) Abnormal size, shape, or position, of kidney.
2. General manifestations of disease, such as fever, chills, cachexia, oedema, hypertension, retinitis and papillœdema, headache, vomiting, dyspnœea and cardiac distress, dizziness, convulsions, etc.
3. Urinary Disturbances.
   (a) Amount.
   (b) Frequency.
   (c) Composition.
   (d) Response to stimulants.

4. Special Tests.
   (a) Cystoscope.
   (b) Blood chemistry.
   (c) Kidney function tests.
   (d) X-ray.

1. Congenital Anomalies.

These are uncommon and of little clinical importance. Their possible presence must not be forgotten, however, especially if nephrectomy is to be done. It is obvious, of course, that removal of a lone kidney is fatal. The more important of these are inumerated below, the names being self-explanatory:

Absence or atrophy of one kidney.
Fused kidneys or horseshoe kidney.
Misplaced kidney.
Congenital cystic kidney (See Polycystic).
Double ureter or pelvis.
Lobulated kidney.
Supernumery kidneys.

2. Movable Kidney.

An abnormally movable kidney is quite common, especially in women, and it is usually symptomless. The difference between a movable and a floating kidney is merely one of degree. The movable kidney is customarily described as one which descends far enough on inspiration that its upper pole can be felt, and the kidney held down during expiration. The floating kidney may be found anywhere in the abdomen or pelvis and be moved freely about in any direction.

The causes are not well understood, but are probably manifold. The right kidney is the more often involved and the condition may be congenital or acquired. It is often associated with a general visceroptosis. Patients showing the general phenomena of neurasthenia may be found to have a movable kidney. It is incidental, however, and probably not the cause of the neurasthenia.

Symptoms when present are very various. Many kinds of referred abdominal pain may be complained of, and an intermittent or obstinate vomiting without apparent cause may be noted. Kinking of the ureter may cause severe ureteral colic (Dietl's Crisis), and an intermittent hydronephrosis. The shape and mobility of the tumor is usually diagnostic, and while repeated negative findings are necessary before the condition can be ruled out, a single positive finding is decisive.

If no symptoms are being caused, no treatment is necessary, and indeed it is best to tell the patient nothing about it. If symptoms are being caused, an abdominal "kidney belt" may support it. If the kidney is too tender for this, or if hydronephrosis has become established, or if pyelitis has supervened, nephropexy may be advised.

3. Renal Calculi.

Kidney stone or nephrolithiasis. These concretions are formed in the tubules or pelvis of the kidney, usually in the young adult male. They may be of various types, the chief being urates, oxalates, phosphates, or mixtures of these. The causes of their formation are not well understood.

The most constant symptom is a fixed pain in the lumbar region, either mild or severe. It may radiate through to the front. The kidney is frequently tender on palpation. Attacks of renal or ureteral colic are frequently met with and they may occur at any time of the day or night. These are often violent and occur as intermittent spasms of pain radiating from the lumbar region around the side to the abdomen and down into the genitals, and are associated with nausea, vomiting, a feeling of faintness, a weak pulse, and a cold, clammy skin. The urine usually contains some pus, some albumin, and some blood—either gross or microscopic. There may be urethral stinging due to the passage of gravel.

The X-ray will reveal the stone in 85 per cent. of cases.

A calculus in a kidney will in time lead to impairment of function by producing a hydronephrosis and possibly pyelonephritis, and the condition will

become bilateral. Hence if discovered it is best removed, and as there is no satisfactory urinary solvent, surgical removal is the only method if the stone is large. If small diuretics with ureteral catherization, may dislodge the stone.

During colic, the aim of treatment is to relieve pain and relax tissues. Morphine is given freely and atropin with caution. Hot fomentations to the addomen or a prolonged hot bath may be of value. Whiffs of chloroform may also help.

When the colic is over and the stone has reached the bladder, instruct the patient to hold his urine for a while in an endeavor to flood the stone out through the urethra. It is wise to examine the stone when passed, as it may be possible to advise dietary changes in order to prevent recurrences. For example, if the stone should be chiefly of urates, avoid excess of meats or other acid producing foods.

4. Hydronephrosis.

This condition of dilation of the renal pelvis by some non purulent fluid, usually urine, is due to a partial or intermittent blocking of the ureter. There are a variety of conditions which may cause this, either congenital or acquired. Some of these are impacted calculi, fibrous tissue strictures, kinked ureter as in movable kidney, and pressure on the ureter by some tumor.

The distension quite rapidly causes pressure atrophy of the renal parenchyma and thus an impaired functional capacity. In addition, of course, there is always the danger of infection and the production of a pyonephrosis.

The symptoms of movable kidney are mostly due to a temporary hydronephrosis, and some degree of distension of kidney pelvis is often observed in nephrolithiasis, hence it is obvious that the symptomatology of this condition is very similar to that of the last two diseases described. Distension of the renal pelvis even of moderate degree causes pain, which may be steady or stabbing, and mild or severe. It is worse standing up than when lying down, and is first referred to the lumbar region in which there is tenderness. Vomiting may be caused. Later the pain is referred to the abdomen, either as general discomfort, or locally to the gall bladder, appendix or pelvic regions.

Kidney pain and distress, accompanied by a diminished flow of urine, followed by the passage of a large amount of urine with relief from distress, is strongly suggestive of obstruction of the ureter with dilatation of the kidney pelvis. The passage of a ureteral catheter and measurement of the urine obtained, or a Pyelogram, will clinch the diagnosis. A normal kidney pelvis should contain less than one fluid ounce.

If the condition advances far there may be nothing but a painless and possibly fluctuant enlargement of the whole kidney. If it is bilateral, anuria and uremia may be the end result.

Treatment will be by relief of the obstruction. A nephrectomy may be necessary if the kidney is too badly damaged or the obstruction cannot be permanently relieved.

5. (a) Pyelitis.

Inflammation of the kidney plevis alone. If there is any considerable involvement of the parenchyme it is called pyelonephritis.

The infection is usually blood borne, but may ascend from the bladder or extend from an adjacent suppurative process. Females are much more often affected than males, and young children are often affected.

The disease is most typical when acute, as if it becomes chronic, there is probably a pyelonephritis present. The usual story is that the patient is suddenly stricken with a severe headache, nausea, severe pains in the back with some tenderness, and high fever with chills. This will be accompanied by a pyuria, possibly intermittent, and the urine is generally acid. The patient

will feel very sick and incapacitated, but after a few hours there may be a remission during which she feels fine and will again go about her work. This will be followed in a few hours by a relapse, however, similar in character to the original attack. In the event of such a story, examine the urine for pus.

The treatment is to promote free drainage by giving lots of fluids, and to change the reaction of the secreted urine, which renders the infection more easily controlled by the body. As the urine is usually acid, large doses of potassium citrate or sodium bicarbonate are given until the urine is alkaline, followed by smaller doses to keep it so. If the urine should be alkaline to begin with, sodium acid phosphate with urotropin is given.

5. (b) Pyelonephritis.

Suppurative inflammation of the kidney parenchyma and pelvis. It may be blood borne, an ascending infection (via the lymphatics about the preters) from the lower urinary passages, an extension of a pyelitis, pyonephrosis, or from renal tuberculosis. It is more common in females than males. Some general infection or focus of infection may be the source of the condition, which may follow some stirring up of such an infection. Its presence is not infrequently associated with some preceding operation or with parturition.

The disease may begin acutely, in which case the symptoms and treatment are much the same as for Pyelitis, or it may be more chronic. In these cases the headache, chills, fever, pain in back, tenderness in flank and vomiting are not so marked. Indeed there may be little else than a recurring pyrexia, with little tenderness. Leucocytosis is common and anemia and pallor may become obvious. However, there are likely to be recurrent attacks of pain and fever, due to acute exacerbations or to obstructions of the ureter, and as the disease progresses there may be some enlargement of the kidney.

The urine findings are very variable. Pyuria is most constant, but varies greatly in degree, even in the same case. Bacteria may be present in large numbers, and hematuria is frequent. Albuminuria is not marked, and except in extreme cases the kidney function is not greatly disturbed.

Differentiation of the condition from Renal Calculi or from Renal Tuberculosis, may be difficult. The X-ray will help to rule out the former, and careful search of the urine for the bacillus tuberculosis will be of use in the latter quandry.

The treatment is much the same as for pyelitis. Rest by bed and dietary restrictions. Drainage is aided by giving plenty of fluids, and an endeavor is made to change the reaction of the secreted urine. If there is a tender tumor in the flank with fever, hot fomentations to the abdomen may be of value. In unilateral cases, if after three weeks of continuous fever, wasting, and pyuria, no improvement is noted, then nephrectomy may be advised. Any underlying cause should be treated, foci of infection looked for, constipation relieved, and any accompanying condition such as a cystitis, should be controlled. Before pronouncing a case cured, the urine should be maintained sterile and free from pus for months, as relapses occur.

The condition may clear up, especially if properly treated early, it may become chronic, or it may progress and lead on to an abscess (nephritic or perinephritic), or to a pyonephrosis.

5. (c) Pyonephrosis.

Distention of the kidney pelvis by pus is termed pyonephrosis. It may result from infection of an ordinary hydronephrosis, or from retention of the pus in pyelitis or pyelonephritis. Almost any degree of destruction of renal parenchyma may be associated with it.

The symptoms resemble those of pyelonephritis insofar as there is a suppurative kidney process. To these may be added certain features resembling a hydronephrosis, namely, a tumor

in the loin which may disappear coincidentally with an increased flow of purulent urine.

Treatment is as for pyelonephritis in the endeavor to control the suppurative process, and resembles that of hydronephrosis in the relieving of the ureteral obstruction. Drainage of the pus by surgical means—nephrostomy—may be advisable.

5. (d) Perinephric Abscess.

Perinephritis may be haematogenous in origin, occurring in such conditions as appendicitis, or some infectious disease, or it may be the result of direct extension of a suppurative process of the kidney or of some nearby viscus.

If acute there will be tenderness in the kidney area, associated with the general phenomena of a deep-seated suppurative process. Usually a tumor may be felt, which is tender and associated with some local rigidity. The spine may be rigid and the thigh flexed. The pus lies between the kidney and the posterior abdominal wall, and in late cases, while it may burst anywhere, it usually points to the surface in the loin. In these cases, of course, diagnosis is simple.

If chronic, symptoms may be few and a palpable tumor may indicate the condition. The swelling is usually diffuse, the tenderness more constant, and the pain less paroxysmal than in the case of pyonephrosis.

The urinary findings are negative unless there is an associated kidney disease.

Treatment is by evacuation of the pus and free drainage of the abscess cavity. If the original cause can be found and dealt with it should also be treated.

6. Tuberculosis of Kidney.

This is not uncommon and is always secondary to a tuberculous lesion elsewhere in the body. In so far as the urinary system is concerned the first lesion is usually renal and it is most commonly haematogenous in origin. It is a disease of young adults and is unilateral during the early stages, while if the process is not checked the second kidney will eventually become involved.

The tubercles may be single or multiple, and they enlarge, become caseous, and may even become calcified, behaving as do all tuberculous lesions. A part or the whole of the renal parenchyme may be replaced by caseous masses, which may be closed or which may penetrate into the pelvis or through the capsule. A perinephric abscess may be formed, or pyelonephritis supervene. The ureters may become affected and so obstruct the urine flow that a pyonephrosis result. In the later stages, the kidney function may be entirely lost. Renal tuberculosis is incurable, once it has become established. However, cases of pulmonary or bone tuberculous occasionally are found to excrete tubercle bacilli in the urine, and clearing up the original focus, stops this phenomenon.

The condition may be very difficult to diagnose. Most cases will give no symptoms referable to kidney. The most common signs are frequency, polyuria, possibly hematuria, with albuminuria and pyuria developing later, and defective renal function being a late observation. Frequency, with a persistent cystitis in a young adult should make one suspect renal tuberculosis. There may or may not be tenderness over the kidneys, the cystitis may cause urethral scalding, and the defective renal function is shown by the polyuria of pale opalescent urine in which the urea content is subnormal. Of course the general signs of tuberculosis should be looked for, such as weakness and emaciation. Pus cells in a sterile urine, or one in which the tubercle bacilli can be found is the most positive sign to be looked for, and the urine should be repeatedly searched for the acid fast organisms.

If the condition is unilateral, treatment is by nephrectomy, and the prognosis is good. If this is delayed the

disease may become bilateral, when the case is hopeless and the patient will in time die from anuria if no complications set in. Hence it is important, if the condition can be suspected at all, to examine repeated urines, and by obtaining ureteral specimens endeavor to be sure it is still unilateral.

After nephrectomy the general treatment of tuberculosis should be continued for some months in order both to clear up any ureteral or vesicular tuberculosis and to clear up the original focus or lesion. This treatment includes rest (general and local) nourishing diet, and irradiation.

7. Tumors and Cysts.

Benign tumors are rare and have little clinical significance.

Malignant tumors are somewhat more frequently met with. They may grow to a large size, and a tumor is palpable in most cases. A persistent aching pain in the loin is the most common symptom, and hematuria is the rule. There may be periods of renal colic due to passage of clots of blood. Cachexia also supervenes, as is common with malignant conditions in general.

There are several cystic conditions of the kidney, the only important one being the polycystic kidney. This is probably a congenital or developemental defect, and produces symptoms resembling in many ways those produced by malignant kidney tumors.

7. (a) Sarcoma.

These are most often found either in infants when they may be bilateral, or in the middle aged when they are unilateral. They grow rapidly, become very large, are encapsulated, and metastases are uncommon in infants but common in adults. In infants pain and haematuria are lacking, while in adults haematuria is the rule and pain common. Death results from exhaustion, and this cachexia with the palpable rapidly growing tumor are the positive signs.

7. (b) Carcinoma.

These are rare and develope in the cancer age period. The tumor is generally small, infiltrates the whole kidney, and passes beyond the capsule. Pain is the prominent feature with early cachexia and probable death within a year. Slight persistent hematuria is common, and secondaries (spread by lymph passages) in lymph glands pressing on veins, may cause venous back pressure. Varicocele, edema of legs, or ascites may result.

7. (c) Hypernephroma.

These are the most common of the malignant kidney tumors, making up about three-quarters of the total. They are slow-growing tumors, which, however, eventually erode a blood vessel, and spread by the blood, secondaries arising usually in lungs, liver, or bone. Secondaries may appear so early as to seem to be primaries, or they may develope years after removal of the primary tumor with no apparent recurrence of the primary. They usually occur in the middle aged, vary considerably in their rate of growth, may be unilateral or bilateral, and are considered to be "adrenal rests."

Pain in the form of a slight persistent ache in the loins with occasional spasms of renal colic will probably be present. Hematuria in the form of an irregular and painless bleeding with occasional bursts of more profuse hemorrhage is the rule. The tumor is seldom found until these earlier phenomena have been present for some months. There may be a slight evening fever.

7. (d) Embryomata.

These are of the nature of "Mixed Tumors," or "Teratomas," and are found in young children. They are unilateral, grow extremely rapidly, and become very large, perhaps even filling the abdomen.

At first, despite the palpable tumor, there are no symptoms, but later, marked wasting occurs and death from ex-

haustion is expected in three or four months.

7. (e) Papillomata of Pelvis of Kidney.

These may be benign or malignant, but all should be treated as malignant when found. Secondaries in the ureter and bladder are common and the finding of a vesicular papilloma in conjunction with a unilateral ureteral bleeding is suggestive of a villous carcinoma of the renal pelvis. They are not common, are unilateral, and occur in the cancer age period.

Hematuria, which may be continuous for months, is the characteristic sign. It may be free or slight and attacks of renal colic due to passage of clots, may occur. Pain is not prominent except in the late stages. The kidney is but little enlarged, though some degree of hydronephrosis may be present.

Treatment.

The treatment of these malignant renal tumors is by nephrectomy, which must include as wide an excision of the surrounding fat and fascia as possible.

It is useless, of course, if both kidneys are involved, and the prognosis is poor in any case. Early diagnosis is, of course, essential. Cases of hypernephroma are the most favorable, and may give excellent results.

7. (f) Polycystic Kidney.

Synonyms are congenital cystic, diffuse cystic, or adenoma of kidney. The kidneys are completely studded with a mass of cysts, lined with epithelium, containing a clear fluid, and varying greatly in size. They may project from the surface of the kidney or into its pelvis.

This condition is usually recognized either in young children or in young adults, and it is bilateral. This is an important point in differentiating from the tumors described already, as these are usually unilateral. Even though both kidneys are affected, one may be much larger than the other. If found in infants, death within a year or two from uremia is the usual result, but in older people the condition may lie latent for years and may indeed only be discovered at autopsy.

The most constant sign is a painless swollen kidney, usually hard and solid, movable, and often nodular. It may be very large. There may be no symptoms, or there may be a dull pain in the loins, often relieved by recumbency. Renal function is impaired with all its attendant associations. This is first indicated by a polyuria with a urine of low specific gravity, and it may progress to the stage of uremia. There are often bursts of haematuria preceded by renal colic.

There is no cure, and treatment is dietary, the object being to prevent overloading of kidney function. Surgical interference is contraindicated unless infection of cysts with suppuration has supervened. In this case, if renal function is but little impaired, nephrectomy, or drainage of the cysts may be advised.

7. (g) Other Cystic Conditions.

Serous cysts, which are rounded swellings growing out from the cortex and containing a thin fluid. They may be palpable, but give rise to no symptoms. They may be aspirated, or if discovered at operation, dissected out.

Dermoid cysts may be found, and of course other tumor conditions may become cystic.

Hydated Disease may effect the kidney, but diagnosis is impossible unless the cysts are being passed in the urine. It is rare, but if found, enucleation of the mass, or nephrectomy is desirable.

8. Non Suppurative Lesions.

These conditions are often grouped under the title of "Bright's Disease," or "Nephritis." Dr. J. R. Robertson in the November issue of the Journal has given an exposition of this group of kidney diseases, and in consequence, a few words will suffice to dispose of them here.

"Nephritis," as used by most auth-

ors, is divided into "Glomerulo Nephritis" and "Tubular Nephritis," each of which may be acute or chronic, focal or diffuse. In this (Toronto) school, "Bright's Disease" is divided into inflammatory and degenerative lesions. The term "Nephrosis" is thus logically used to represent the degenerative type, and corresponds closely to the expression "Tubular Nephritis" of most authors. The term "Nephritis" in this school is thus reserved for the non-suppurative inflammatory lesions, and corresponds with the expression "Glomerulo Nephritis" of other authors.

The amyloid kidney might possibly be sub-grouped under Nephrosis, but as the amyloid substance is really deposited in the tissues rather than being a degeneration of them, it is kept separate.

The great importance of these nephridites lies in the fact that the impairment of renal function is so extreme.

Briefly, Nephritis is characterized by a diminished renal ability to handle nitrogen compounds, and it terminates in uremia if uncomplicated. This in the more chronic stages results in a high blood pressure and a polyuria of urine of low fixed specific gravity. In the acute stages blood, pus and cellular casts are found in the urine, with not much albumin.

Nephrosis, on the other hand, is primarily a lessened ability to handle water and salt. In the acute stages the urine is loaded with albumin and body oedema is marked. Pus cells are present, but no red cells or cellular casts are found in the urine. Chronic nephrosis is not believed to be a development of the acute disease, being a separate condition. In this condition the blood pressure is not raised, and oliguria of urine of high specific gravity is to be looked for.

Of course, both conditions usually exist together, and it is often very difficult to determine which predominates.

Treatment is by rest, which is obtained by putting the patient to bed, reducing the intake, and increasing the excretion by other channels. Nephritis can only be cured in the acute stage, though exacerbations of the chronic state are treated in the same way. Acute nephrosis tends to clear up of itself. A suggested method is to put the patient to bed, feed him 500-800 ccs. of milk daily, and give saline purges. After some days cream, sugar, bread, etc., are gradually added until finally a full diet is given. Make all additions cautiously, watching the temperature and urine. An ordinary case will be albumin free in a month or so, but if not, persist in the rigid diet for months because it is the only hope of obtaining a real cure.

In dealing with the chronic states, the "Kidney Function Tests" may be of value in determining the patient's dietary limits. Dietary indiscretions must be strictly avoided, and as little strain as possible put on the remaining kidney parenchyma. For example, while some protein in the diet is essential, the class "A" proteins are the most efficient and put least strain on the real function. A fatigued kidney is more liable to show an exacerbation, and an exacerbation may result in death.

The presence of other foci of infection is liable to cause exacerbations, and hence these should be removed if possible. Surgical interference is contraindicated in the acute stages, but foci should be thoroughly treated when the kidney lesion subsides.

If rest, as above, is carried out, the life of the patient may be prolonged for years.

The Etiology and Treatment of Backache.

By RAY. M. McKEOWN.

The physical complaint known as backache is so common, so variable, and so inclusive in its nature, in its causes, and in its effects, that it constitutes a problem of great importance to the practitioner. In presenting the present-day opinion on this question it is my intention to quote freely, and in some cases at length, from authoritative sources.

Etiology and Treatment.

A proper understanding and appreciation of the factors involved in the etiology of backache is dependent primarily upon a fairly comprehensive knowledge of the anatomical structure of the spinal column and pelvis, and the relationship that these bear to each other, and to the skeleton and its attachments in general.

We are well aware of the meaning of local and referred pain. These two types of pain occur in backache, and we may therefore roughly divide the etiological factors herein involved into these two types.

(1) *Local Causes of Backache*: The local cause of back pain has been the subject of extensive study of late years, but yet we find that in many cases the literature contains a wide divergence of ideas. However, I shall consider the known facts in so far as possible, and avoid controversial opinions.

We know that wherever a sensory nerve is situated pain may be produced, and we also know that sensory nerve endings are found in all tissues except cartilage. Since this is true we may expect to find the cause of local back pain in association with any of the following structures:

1st—In the muscles.
2nd—In the fibrous tissue.
3rd—In the nerves.
4th—The joints.
5th—The bones (meaning pathological processes of the bones producing pain in the periosteum and the muscular and ligamentous supports), and
6th—Lesions of the spinal cord itself.

It is our intention to discuss local backache under these headings.

1st—Causes in the Muscles of the Back:

The muscles of the back are concerned with the two important functions of posture and movement. Without muscle tonus, which is elaborated through the activity of the cerebellar and prespinal systems, posture would be impossible. Postural muscle tonus is maintained indefinitely and is incapable of fatigue normally. Movement on the other hand depends on muscular contractions under the control of the cerebral pyramidal arc. This is fatigable normally in contradistiction to the unfatigable postural tonus. The normal postural tone may be interfered with and become deficient if the integrity of the nerve arcs concerned is damaged as in the case of chronic toxemias from infective processes, or neurasthenic states, or if the muscles are unduly stretched as in bad sitting, standing, or walking attitudes, or in occupational endeavours. With the occurrence of deficient muscular tone posture is maintained by unusual and even violent muscular movement or contraction which we have seen is fatigable. We know that muscular fatigue past a certain point produces pain, and such we find is true here. If on the other hand the loss of tonus is due to a sudden strain the pain may be intense, and one will find on examination a local area of extreme tenderness, and even extravasation of blood.

H. A. Riley, of New York, believes that the so-called "lumbago" is merely acute, subacute or chronic myositis.

This results in muscle spasm, and pain which may be localized or radiating. Riley furnished the report of an interesting biopsy done on a case of myositis in which he found definite muscular degeneration with increase in the sarcolemma and fixed connective tissue cells, shrinking of the muscle fiber with fatty degeneration and a complete loss of the normal cross striations.

The Treatment of Pain in the Muscles of the Back: The importance of a well-taken history and careful physical examination can hardly be over-emphasized. The determination of the cause and the site of the damage is of prime importance. If toxemia is present or if there are postural defects these must be remedied. Weakened muscles must be thoroughly rested and prevented from further stretching by appropriate supports such as adhesive strapping, corsets, or a leather belt. If one leg is longer than the other the sole and heel of the boot on the short limb may be built up. Frequently a spinal brace is of great value. In all cases heat, massage, and appropriate exercises should be carried out. If the history is one of sudden severe pain following a lifting strain or like injury the patient may be greatly helped by absolute rest in bed on a stiff hair mattress or frame, by application of heat, by massage, and adhesive bandage strapping.

2nd—Causes in the Fibrous Tissue of the Back.

This is said by many to be the commonest cause of pain in the back, and is frequently termed "lumbago." The site of the pain may be in the fibrous tissue of muscle attachments, in the ligamentous and fascial bands between and below the spinal muscles, or even in the intra muscular trabeculae. Galloway explains the cause of pain here on difficulty of circulatory compensation in the fibrous tissue during barometric changes. This leads, he believes, to an inflammatory condition termed "acute lumbago," or more correctly I believe "acute fibrositis." In any event there is a sudden excruciating pain over the area with many of the signs of an acute inflammation. When this heals there may be chronic nerve irritation as the result of minute adhesions, and one may even palpate small fibrous nodules or bands over the site of the healed lesion. This end result is termed "chronic lumbago." Pain is felt most frequently in these cases on movement, and is the result of muscular contraction tensing the already irritated fibrous tissue. Bending the back through muscular relaxation can be performed with little pain, but pain will be felt when the erect attitude is resumed by muscular contraction. In unilateral fibrositis the patient can bend to the affected side, but has pain on attempting to resume the mid position.

Sacro-iliac and lumbo sacrel ligamentous strain will be considered for the sake of clarity under causes in the joints.

The Treatment of Pain in the Fibrous Tissue: One here, as before, should first determine the cause through a careful history and physical examination. Gordon recommends the following treatment:

General:

1. Improve patient's general condition.
2. Saline purges to reduce toxicity.
3. Water baths for a like reason.

Local:

1. Rest parts by adhesive strapping.
2. Apply local heat.
3. Apply counterirritants.

Later:

1. Massage and appropriate exercises to reduce any tendency to scar tissue formation, and to stretch any that does form.

3rd—Causes in the Nerves of the Back:

The commonest cause of nerve pain in the back is compression. This compression may be at the point of exit of the nerve root from the spinal canal, along the course of the nerve, or at its termination. The production of compression at these points is most frequently the result of contracting scar

tissue resulting from arthritis, from fibrositis, or a temporary oedema. At such times a so-called "shooting pain" is felt in the course of the peripheral nerve involved. Other causes of compression spinal nerve pain mentioned are:

1. Fracture and dislocation of the vertebrae.
2. Tumors of the osseous tissue
3. And Carcinoma of the rectum or uterus pressing on the pelvic nerve.

In a lesion in the lower back nerves, as well as the bones, muscles, and ligaments, are involved. The nerve trunks of the lumbar and sacral plexus lie in the closest possible relationship to the transverse processes of the lower lumbar vertebrae, to the articular facets, to the sacrum, and to the sacro-iliac joints. This means that excessive motion, laceration producing swelling or arthritic hyperostoses may irritate nerves. The symptoms resulting may be mild or severe, and may be referred anywhere in the course of the sciatic, lesser sciatic, sacral, gluteal, anterior crural and obturator nerves.

Under this heading we may briefly consider "Sciatica." This term Allison believes should be restricted to cases of pain in the course of the sciatic nerve or its branches where disease in the pelvic cavity or neighboring joints has been excluded. Riley on the other hand would exclude a diagnosis of "sciatica" unless there was loss of muscle strength, muscular atrophy, reduction or loss of reflex activity, and altered sensory perceptions. There must also be pain in the area supplied by the affected nerve, alterations in electrical reactions, and tenderness in the nerve trunks on direct palpation or stretching. Any others Riley would term either fibrositis or myositis, and usually myositis he believes. This seems the general opinion at present and one I strongly incline to.

True sciatica we may say is a neuritis, and is a primary involvement, giving symptoms of organic nerve disease such as nerve tenderness, anesthesia, atrophic muscular paresis, and reaction of degeneration, and the common causes are infections with toxemia, and constitutional diseases such as anemia, and diabetes.

Treatment of pain in the nerves: Treatment here depends on the cause—when this is removed the pain clears up. Heat is applied while the cause is being determined for symptomatic relief if for nothing else. If it is impossible to remove the cause many try the milder sedatives, and if these give no relief prescribe the opium preparations.

4th—Causes in the Joints:

When we consider the causes in the joints of back we enter into what is probably the most interesting part, but at the same time the most debated, of the entire question. For descriptive purposes we shall consider this under the following heads:

1st. In joints other than those of the pelvis.

2nd. In the pelvic joints themselves, by which we mean the sacro iliac, and the lumbo-sacral.

1st. *In joints other than those of the pelvis*: The vertebral articulations are connected by broad, flattened discs of fibro cartilage of a more or less complex structure—the whole forming an amphiarthrodial joint. It is in and about this joint and particularly about the facets that we find arthritis and with which we will chiefly concern ourselves here, omitting other processes such as tuberculosis. Arthritis may be either acute and of the peri articular type when it is called rheumatoid arthritis, or it may be chronic and of the osteo arthritic type. Rheumatoid arthritis has an acute onset, produces variable pain due to a protective muscle spasm, is noted by a peri articular swelling, may result in destruction of the fibro cartilaginous disc, rarify the neighbouring bone and form fibrous adhesions between the surfaces. It results in no definite osteophytes. On the other hand the chronic or osteo arthritic type

appears usually in the late 40's, and appears to have exposure, injury, general ill health and dental caries as etiological factors. The onset is slow and the pain in the pure type slight, but in "spondylitis deformans," which is the form particularly found in the vertebral joints, the pain is severe following an acute onset. "Sponlylitis Deformans" is most severe in the upper dorsal and cervical regions, and may result in bony ankylosis and even ossification of the spinal ligaments. Two groups are recognized, (1) that of Van Bechteren, where the spine alone is affected and the nerve root symptoms of pain, paraesthesia, and muscular atrophy marked, and (2) that of Strumpell-Marie, where the hip and shoulder joints are also affected and pain greatly lessened. In spondylitis deformans the outcome is either a stiff, straight back or the typical kyphosis of the labouring man.

The pain here is due to one or more of three causes: (1) the vertebrae are distorted, deforming the spine, and the voluntary muscles are called upon to maintain posture, as a result of which they being fatigable, soon produce pain.

(2) The synovial articular lining and capsular investments become swollen and inflamed, producing pressure and irritation on the nerves and resulting in pain.

(3) Or the osteophytic outgrowths and distorted vertebrae may produce nerve compression and result in the severe pain of sponlylitis deformans.

Treatment of pain in joints other than pelvis: After first determining the cause one proceeds to treat it. If it is arthritis, as it usually is, the treatment consists of (1) removing all septic foci, (2) improving the general health, and (3) treating the involved joints. The joints are rested in good position during the acute pyrexial stage. After the acute stage movement and exercise is instituted to prevent contracture, fixation and muscle wasting. Massage ranges from light to deep and severe. Counter-irritants are useful, and the best drug apparently is sodium salicylate. The joint pain is frequently much reduced by Scott's dressing locally and aspirin by mouth. Diathermy helps some cases, and heat in some form benefits practically all. Hydrtoherapy is used by many. It is interesting to note here that P. Jenner Verrall believes 65% of arthritis of the back is caused by the gonococcus, and is a metastatic infection from either the female or male pelvis. This constitutes by itself a great problem in gynecological causes of back pain.

2nd. *In the Pelvic Joints*: It is about this anatomical region that the causes of pain have been debated with great vigour for some years, but in so far as it is possible we will avoid controversy. Under this heading we will discuss:

1. Sacro-iliac strain.
2. Sacro-iliac subluxation.
3. Lumbo-Sacral strain.

1. *Sacro-iliac strain*: Ligamentous strain at the sacro-iliac joint is the result of one or two causes. First, it may be muscle fatigue to the extent that support is no longer given by the muscles to the bony parts, or secondly it may be the result of over extension of muscles as in parturition. Ligaments here are as elsewhere in that they are inelastic, and when the limit of their strength is reached, they rupture, and after rupture they unite very slowly. Such ruptures may range from slight to complete tears.

Because stability of the sacro-iliac joints is so greatly dependent upon ligaments, these great articulations placed at the junction of the body and the lower extremities are mechanically weak to maintain the heavy stress thrown upon them, especially of backward or forward tilting of the base of the sacrum.

Briefly, then, low back pain from the sacro-iliac joint is the product of muscle fatigue, of scar tissue pressure about sensory nerves, or of inflammatory processes. Being thus essentially the same as under fibrous tissue mentioned before.

2. *Sacro-iliac subluxation*: This par-

ticular factor in the production of low back pain is, to quote Wentworth, greatly misunderstood. We know that the sacro-iliac joint is one with little possibility of motion except through relaxation as in pregnancy. There is, however, a certain degree of anterio-posterior motion on a horizontal transverse axis at the third sacral segment, and it is possible, we know, to slightly separate the ilia by a backward tilting of the base of the sacrum.

Relaxations of these articulations occur physiologically at the menses and at pregnancy. They occur also as the result of general debility and postural strain. In subluxation there is rarely a frank separation of the opposing articular surfaces, but there is enough disturbance of the small irregularities on the cartilaginous surfaces, which are normally found there, to produce disturbance of sensation and function. The backward displacement of the base of the sacrum is the type most often seen in males following traumatic stress. This produces the so-called "flat back" deformity. The type in which the base of the sacrum is forward is usually the result of muscular weakness, and is predominantly found in women, the adipose, neurotics, paralytics, and the generally debilitated. These "bone slippings" may cause irritation of the lumbar plexus by bone pressure, by the pressure of exudate, and by nerve stretching.

3. *Lumbo-Sacral Strain*: This may be in association with trauma, a sacro-iliac strain, or with incorrect posture, or anomalies.

This joint is strikingly weak from the mechanical point of view. In 1911 Goldthwait clearly pointed out the mechanics of the joint. The plane between the body of the 5th lumbar and the base of the sacrum inclines 30 degrees with the body erect. The ligaments give considerable support, but if acting alone, would soon stretch. It is the articular processes which prevent a forward slipping of the lumbar vertebra. One-half of the flexion and extension of the lumbar region takes place at the lumbo sacral juncture. Whatever the angle between the plane of the lumbo-sacral juncture and the horizontal may be, there is no question but that there is a very considerable shearing stress of the superimposed body weight as it is transmitted to the pelvis at this juncture.

This juncture is also the union of the mobile spine and the immobile sacrum, and is consequently a weak mechanical arrangement. Augmenting this weakness is the usual greater amount of rotation at the lumbo-sacral than at the inter-lumbar articular facets. It must be remembered that the pivot of motion is not at the articular facets, but in the bodies of the vertebrae. The dorsal and sacral type permits free rotation, but limits extension. The lumbar type limits rotation, but permits flexion, extension, and lateral bending.

Spondylolisthesis, or forward slipping of the lumbar vertebrae, does occur, but clinically is only the extreme of lumbo-sacral strain. Beyond that I shall not consider it here.

Treatment of pain in the pelvic joints: Allison says that "the one fundamental factor" . . . involved here," is relief experienced by firm pressure and support over these joints," and "this must be the anchor sheet of therapy with massage and exercise as important auxiliaries." This can be gained either by the use of a well-fitted belt, or by operative fixation. In cases of subluxation many first manipulate the involved joint to tear down any adhesions, and then support by a suitable belt. Verrall treats spondylolisthesis by means of a firm back brace with abdominal support.

5th—Causes in the Bones:

The bones of themselves have no sensory nerves, but the periosteum about the bone has. Hence we will consider those conditions in the bones that may produce pain in the periosteum or muscular and ligamentous supports of the spinal column.

Here we are dealing with:

1. Congenital anomalies and sacralization of the vertebral column.

2. Infective processes.
3. Trauma, and
4. New growths.

1. (a) *Congenital Anomalies*: Congenital anomalies of the spine other than the lumbar and sacral do not present much of note, and will be omitted. However, those individuals who present anomalies in the lower back are susceptible to weakness, strain, and pain there. The pelvic tilt caused by unequal length of legs throws undue strain upon all ligaments of the lower back. A sacralized 5th lumbar on one side will throw undue strain and activity on the ligaments of the other side. That the lumbo-sacral region is morphologically unstable is shown by the large number of anomalies presented there. However, it is, we have found, the degree of physiological balance between the bones and their muscle and ligamentous supports which determines the development of pathological manifestations. It is never safe to base judgment on anatomic peculiarities alone no matter how great they are. A bifid spinous process may indicate a potentially weak point of attachment for interspinous ligaments but, on the other hand, the ligamentous arrangement may be quite adequate to control such an anomaly, and pain may be absent. The anatomic anomalies of the lumbo-sacral region are legion. Dwight states that it is the exception to find a normal 5th lumbar vertebrae. George has established a series of normals by radiographic research. Hibbs is so impressed by anatomical variations as the cause of symptoms that he predicts the time of exploratory operations on the lower spine.

(b) *Sacralization*: is a partial or complete fusion of the 5th lumbar vertebrae and the sacrum, or of an articulation of the transverse process of the 5th lumbar with the ilium. Wentworth believes that logic is against back pain being caused by sacralization, however, the various theories as to the method of production of pain here are:

(1) That there is pressure on the muscles or ligaments between the transverse process and the ilium;

(2) Irritation or arthritis of abnormal joints or bursae.

(3) Strain on the sacro-iliac or lumbo sacral joints due to leverage of the transverse process on the ilium and sacrum.

(4) Stretching or pressure on the nerves of the lumbo sacral plexus.

2. *Infective processes*: Under this we will merely mention in passing tuberculosis and poliomyelitis. All infective processes cause in one way or another abnormal strain on the muscles and ligaments, and result in pain.

3. *Trauma*: By trauma of the bones we mean fracture and dislocations. Fractures of the spine may be:

(a) Simple compression fractures of the body of a vertabrae.

(b) Fracture dislocation—simply a further stage of (a), and lastly,

(c) Injuries of the processes.

The pain produced here is obviously the result of periosteal nerve pressure, though it may also be the result to some extent of ligament and muscle strain or tear.

4. *New Growths*: Tumors of the spinal vertebrae may be primary or secondary. Carcinoma is the most frequent malignant tumor, and is usually metastatic from a primary growth in the breast or thyroid gland in the female or the prostate in the male. Secondary, sarcoma may occur in the vertebrae, but usually it is in the soft tissues about, when it causes secondary destruction of the bone. The earliest and most predominant symptom is pain. Frequently it is excessively severe and is brought on by the slightest movement. This pain may be the result of pressure from the enlarging growth, to interference with the blood supply and a rapid myelomalacia, and sometimes even from cord compression following collapse of a vertebrae. The result here is usually a rapidly developing flaccid paraplegia with loss of control of bladder and bowels.

Treatment of pain arising from bone pathology: The treatment in the main here is an orthopaedic problem—a discussion of which would be too lengthy

and involved for our purposes. Suffice to say that the treatment is either spinal extension and rest or operative interference.

6th—In the Spinal Cord Itself:

By this we do not mean pain in the spinal cord itself, but rather pathological conditions in the spinal cord which result in the production of pain, referred by the distribution of the roots affected in or to the back. The group of causes consists of meningitis of the Pia mater and dura mater; the spinal form of epidemic encephalitis; myelitis; meningo-myelitis; herpes zoster, and syringomyelia. These usually present, however, such an outstanding neurologic complexion that their essential character is recognized early.

The group to which special attention is drawn here includes adhesive arachnoiditis, the neoplasms of the spinal cord, and radiculitis of the cauda eguina.

Adhesive arachnoiditis occurs when adhesion takes place between the arachnoid and the surface of the pia mater. The free subarachnoid space is thus interfered with and the normal circulation of the cerebrospinal fluid interrupted. Compression of the spinal cord takes place resulting in an interference with the impulses traversing the long descending and ascending tracts within the cord. As a rule the condition is characterized by more or less pain of a dull, aching character referred to the distribution of the roots that are affected.

Spinal cord neoplasms may be extramedullary, meaning extradural, or they may be intramedullary. Pain is preeminently the system most constant in appearance with neoplasms arising in the space between the spinal cord and the inner surface of the dura mater. It may be present in intramedullary neoplasms, but is much less common. The origin of pain here is an involvement of the dorsal nerve roots, and is the result primarily of pressure. The pain is usually dull and aching—though it may be a severe shooting, darting pain. Cases will go for months with a diagnosis of "rheumatism" or "neuritis" before the true nature of the disease is recognized.

Radiculitis of the Cauda Equina was first described by Kennedy, Elsberg, and Lambert in 1924. Occupation, sex, infection, and injury apparently play no definite role in its etiology. The commonest ages affected seems to be between 30-40. The onset is gradual and characterized by pain in the back, lower extremities or about the perineum. The pain is usually severe, is intermittent, and may radiate into the lower limbs. There may be paresthesia instead of pain. There later appears a sensory disturbance showing a radicular or segmental distribution affecting the lumbar or sacral dermatomes. The pathology appears to be an inflammatory process compressing the roots of the cauda equina and producing pain. The roots show degenerative changes of a typical nature. Riley suggests that this condition may be related to meningomyelitis.

Treatment: Adhesive arachnoiditis falls within the realm of the neurological surgeon as do the others. Treatment here consists of freeing the surface of the adhesions by operation. Neoplasms are removed with varying degrees of success by operation—a great deal depending on metastases, extent of growth and its nature. Radiculitis of the cauda equina is also best treated by operative interference—the nerve roots apparently regaining their activity when the inflammatory pressure is reduced.

(2) *Causes of Referred Pain in the Back:* Rather than discuss at this point the obstetrical, gynecological, urological, and other causes of referred pain we will review these causative factors under the one head without differentiation. The proper presentation of this factor in the cause of back pain offers a fascinating study, but time will not permit me to more than mention it.

We know that sensory impressions are conveyed from the viscera by the

afferent sympathetic fibres, and these pass by the rami communicantes to join the posterior roots, so that certain posterior ganglia may be the cell stations both of visceral and somatic sensory fibres. Pain may thus be referred to the somatic fibres served by the sensory somatic nerves through these ganglia if the viscera are diseased from which the sympathetic fibres of the ganglia travel. Hence disease processes of the thoracic, abdominal, and pelvic viscera may all produce referred pain in the back.

In the sacral region referred pain is very common. The upper sacral nerve communicates directly with the pelvic plexuses, and pain is referred from the uterus, bladder, prostate, and other regions. This pain is commonly felt over the sacro iliac joints, but is not a deep pain, such as is characteristic of sacro iliac disabilities.

To briefly summarize the etiology of referred pain we will state that whenever any one or combination of the three following causes are present in the viscera about a nerve root, trunk or ending, pain will be referred and felt in the back. These causes are: *First*, congestion or inflammation. *Second*, traction, and *Third*, pressure.

Treatment of Referred Pain in the Back: Treatment here will lead nowhere unless the diagnosis is correct; however, once the diagnosis of the cause has been made the treatment resolves itself into removing it. The therapy must necessarily divide itself into the anatomical area involved as well as the type of lesion producing the referred pain. This is a subject entirely too great to be handled within the scope of this paper, and one is referred to appropriate texts. Treatment of such back pain is often annoyingly slow, and again the mere replacement of a misplaced uterus will clear the pain up like magic.

CONCLUSIONS.

1. The causes of back pain may be local or referred.
2. The local causes may be divided into:
   (1) Causes in the muscles,
   (2) In the fibrous tissue,
   (3) In the nerves,
   (4) In the joints,
   (5) In the bones,
   (6) In the spinal cord itself.
3. The causes of referred pain may be considered as due to:
   (1) Congestion and inflammation about nerve roots, trunks, or endings.
   (2) Traction on nerve roots, trunks or endings.
   (3) Pressure on nerve roots, trunks or endings.

One must constantly remember the anatomical distribution of nerves from the area about which pain is felt in the back.

4. The treatment consists in:
   (1) Determining the cause—which can be done by:
      (a) a carefully taken history,
      (b) a carefully taken physical examination,
      (c) laboratory findings—especially radiographs.
   (2) And removing the cause—which may be done by:
      (a) conservative means such as
      (i.) providing rest by
         (a) bed—on a hard mattress or frame,
         (b) adhesive strapping.
         (c) carefully fitted belt.
      (ii.) improving general condition by:
         (a) removing all septic foca,
         (b) diet,
         (c) tonics and drugs with
         (d) massage and regulated exercises.
      (iii.) improving local condition by:
         (a) heat,
         (b) hydrotherapy,
         (c) counterirritation,
         (d) regulated exercises and massage.
      (b) Or lastly, operative interference to remove the cause, to fix the joint, or to manipulate it.

THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

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EDITORIAL.

Culture.—Joseph Collins, author of that rather unusual book, "The Doctor Looks at Literature," states that the object of every medical student is success. There is nothing new in that, but when he says that this is measured not only by professional regulation and material prosperity, but by self-realization, there is. In turn he believes self-realization is facilitated by two elements—taking thought and gaining culture. Familiarity with the intellectual activity of the past and present and reflection upon its bearing on our welfare, conduct and lives constitute culture to him.

What is more interesting than a professional man who can talk on the cultured side of life? The English are not infrequently criticized for their idolizing of tradition, but the proper appreciation of the past and its significance on the future mellows and matures one.

Beyond doubt Sir Wm. Osler was a great man in our profession, and a more widely read man probably did not exist in his day. The extent of his references in his addresses to the unknown gems of literature is little short of marvelous. In his life by Cushing we find that he did this by retiring at 11 o'clock and then reading from his "bedside library," as he dubbed it, until midnight. How many of us do that? Not many, I dare say, but yet we apparently are all well aware of its value. Culture is something the practitioner of today in many instances is censored for the lack of, yet professionally he is unquestionably a better prepared and read man than his predecessors.

Is Collins right when he states, "I am convinced that the medical student who knows the great classics of the past is better equipped to practise medicine

than he who has Quain, Osler and Howell at his finger tips?"

Esculapius a Premature. — According to certain mythologies, Apollo was the first to point out the indications for inducing premature labour. The history tells that the god, jealous of Coronis, who had been unfaithful to him, put her to death after he had taken from her womb the infant which she carried. He gave the infant to the Centaur Chiron to raise. In this manner Esculapius, the god of medicine, was born!

Daffydil.— There has been talk throughout the Medical Faculty of discontinuing Daffydil. It seems that the quality of the skits has fallen far below par, and that in many instances the ludicrous has actually been the obscene. Daffydil can be made as great a show as many presented by the students of other universities—in fact in the past it unquestionably was. Daffydil needs time and thought, and it should not be an attempt to flout the border line things of life and call it a show.

Daffydil is beyond doubt on probation. The Medical Society is making a determined effort to improve it, and is asking for the whole-hearted support of all members of the Faculty. All years are offering a ten dollar prize for the best skit, and the President of the Sixth Year, is particularly anxious that all Sixth Year men enter into the competition, in as much as this is their last year.

See your class president and get behind the effort to make this the biggest and best Daffydil ever produced.

The Journal.—The yearly subscription sales have far surpassed those of any previous years. For this we thank the Faculty, and sincerely hope that we may continue to hold their faith in us.

The article from Professor J. J. R. MacLeod is a pleasure to read. We know now that we will not be forgotten and are glad.

The articles this month offer a widespread interest. The possibilities of cancer research offered in Dr. Costain's paper are new to us and give much food for thought. Dr. R. I. Harris on "Tuberculosis of the Hip," offers an interesting paper to the upper years. Dr. Harris is considered an authority on tuberculosis of the bone. Professor Linell presents a brief applied anatomy paper on the glossopharyngeal nerve which will be of interest to all years. As the professor indicates, this nerve is the abused and forgotten member of the cranial nerves. Beecher Weld completes our articles on the kidney for the year with a paper on the surgical kidney. Unquestionably such a complete review as Weld offers has taken time and work. The article on medical history by Miss Gee is what we all need to gain that historical background essential to the understanding of any question. McGarry offered us a review of medical men in sports up to December first. However, lack of space does not permit us to publish this excellent review until next month.

Next month we hope to publish articles by Professors Harding and Holman, and Drs. John Oille, Richards, Janes and MacFarlane, as well as a number of others from the students—particularly one from Bensley on "The Colloidal Gold Test," that will interest all years.

Dr. C. W. Service delivered a lecture on the work of medical missionaries in China to the Medical Society, on November 26. The wastage of human life and the apathy and indifference of officials to sanitary measures was stressed. The lecture room was crowded to capacity. The address was very successfully handled and presented.

Mr. J. S. Hawkins, class president of Sixth Year, has resigned due to illness. His illness is highly regretted by all. Mr. Hawkins, while in office was extremely capable and popular. Mr. Vic Railton was nominated successor by a handsome majority.

Caesarean Section—A Historical Review.

By EVELYN A. GEE, 3T0.

The term Caesarean Section should be applied only to the operation of incising the abdominal wall and uterus to deliver the child at or near term.

The origin of the term Caesarean has been much disputed. For a long time it was popularly believed that Julius Caesar was brought into the world by this means and that he obtained his name from the operation by which his birth was accomplished (a caeso matris utero). This derivation is probably incorrect since his mother, Julia, lived many years after his birth, and at that time the operation was not performed on the living woman, at least in countries under Roman rule. It is also a fact that Julius Caesar was not the first of his name. Aelius Verus, a man more noted for his good looks than good morals, probably bears that honour.

There are many other suggestions for the origin of the word, e.g., from a Moorish or Punic word Saesa, meaning elephant. (This animal trampling on a serpent, appears on coins struck in honour of Caesar). It may be called Caesarean as being too grand to have been first performed on ordinary mortals just as the Germans gave it the name of Kaiserschnitt. In 715 B.C. Numa Pompilius, King of Rome, in the Lex Regia, ordered that no pregnant woman should be buried before the child had been excised. The Lex Regia became the Lex Caesarae under the rule of the Emperors. After this the operation was known as the Caesarean Operation.

Whatever may have been the origin of the term the operation itself is of great antiquity. There is evidence that it may have been known to the early Egyptians. It is referred to in the myths and folk lore of the early Europeans. Probably a large proportion of the early races recognized the propriety of Caesarean Section on women who died late in pregnancy, in the hope of saving a foetal life, of value to the community.

Caesarean section of the living is of slightly more recent date. Passages in the Talmud seem to have reference to it. The children delivered through the flanks of their mothers were given the name Jotze Dofan by the Ancient Jews.

Perhaps the strongest suggestion of the possible early development of Caesarean Section on the living among uncivilized peoples is furnished by the operation witnessed by Dr. Felkin in Uganda in 1878, performed by a native specialist. The operator evidently possessed distinctly more knowledge of asepsis than his civilized confreres of that period, since he washed his hands and the field of operation with banana wine before operating, instead of deferring the cleansing of his hands until after operation, as was more or less common in civilized practice at that time. The patient was anaesthetized by being made drunk with the same preparation. A rapid incision of the abdominal wall and uterus was done, the child removed and the cord cut. The placenta was then removed, the cervix dilated from above, and the uterus was massaged and compressed to check haemorrhage. The peritoneal cavity was cleansed of liquor and blood by raising the patient up, and then the abdomen was closed by means of pin and figure of eight sutures. The wound was dressed with a paste of crushed herbs. The wound healed in eleven days and the convalescence was only slightly febrile, with the temperature under 101° throughout the whole puerperium. Such a well-developed technique suggests that the operation had been under development for a long time, and it seems possible that Caesarean Section may have been practised among certain barbarous races with success, perhaps for

centuries, while among civilized surgeons it remained an operation of the greatest danger.

It is convenient to divide the history of Caesarean Section into four periods.

The first period—previous to 1500—Up to this time the operation was done almost exclusively after the death of the mother. The first detailed account we have of the operation on the living mother is given by Bauhinus. It is a lively description of an operation performed about the year 1500 by the courageous sowgelder, Jacob Nufer, of Sigershaufen, who, after 13 midwives and several lithotomists had failed to deliver or relieve his wife, decided to operate with a razor. The child lived to the age of 77. The mother recovered and was delivered later of twins. After the twins four other children were born. It is probable that the operation was not a true Caesarean Section, but the removal of an extra uterine child from the abdominal cavity.

The Second Period—1600-1876.—During this period the operation was occasionally performed on the living as a last resort and was attended with a high rate of mortality. The first generally accepted Caesarean Section was performed in 1610 by Trautman, of Wittenberg, on a woman with hernia of the gravid uterus. From this time on the operation was performed from time to time and in spite of the awful mortality which aroused the opposition of many of the leading obstetricians of Europe, it gained a foothold and was accepted as justifiable in hopeless cases, where other methods had failed. The attitude of the Catholic Church in favouring the operation because it gave an opportunity for baptism of the child, had much to do with the development of the operation. The high mortality was due to crude technique and to the fact that the operation was performed on women who were bad operative risks. The abdominal wall and uterus were incised and the child and placenta extracted. The contraction and retraction of the uterus walls were relied on to control haemorrhage, the uterine incision not being sutured and the uterus was dropped back into the abdominal cavity. Harris pointed out that the patient's chances of recovery were better when the patient, unable to endure the pain of labour longer, performed the operation on herself, or when the abdomen was ripped open by the horn of an infuriated bull; and he collected nine such cases from the literature, with five recovering, in contrast to 11 Caesarean Sections performed in the city of New York during the same period with one recovery.

The Third Period—1876-1907. — In the year 1876 Edoardo Porro introduced his operation of amputation of the uterus after Caesarean Section. At the same time the antiseptic surgery introduced by Lister in 1867 was reducing the death rate of all operations. Sanger in 1882 introduced closure of the uterine incision by suture. Since this led to preservation of the uterus, it has been designated as the conservative Caesarean operation.

The Fourth Period—1907 to date.—In 1907 Frank of Cologne introduced the extra-peritoneal operation in cases not suitable for the classical conservative Caesarean. Later DeLee urged the abandonment of the classical section in favour of an extraperitoneal operation even in clean cases. DeLee's operation has been widely adopted with a resulting lowered mortality rate, that in the Burnside Clinic being 1.5% in uncomplicated cases.

Few operations have passed through such a discouraging early phase to become acknowledged as among the greatest life-saving procedures of modern surgery.

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Dr. Clarence Leslie Starr

Professor of Surgery in the University of Toronto.

The death of Dr. C. L. Starr came with startling suddenness. A few of his intimate friends knew of his serious illness, but no one thought the end was near. In fact his medical attendants hoped that after a few months' rest he might be able to resume work. Forty-eight hours before his death, symptoms suddenly appeared which indicated that a fatal issue was inevitable, and he succumbed to the final attack of Angina on the evening of Christmas Day.

He was a distinguished graduate in Medicine of the University of Toronto and a member of the teaching staff for thirty years. In 1921 he became the first full-time Professor of Surgery, and, at the same time was appointed Surgeon-in-Chief of the Toronto General Hospital. Previously he had been Chief Surgeon in the Hospital for Sick Children. On his assuming the duties of the Chair, he completely reorganized the Department of Surgery. The Department under his direction was recognized not only within the University as thoroughly efficient, but many distinguished visitors from various parts of the world were so impressed that they expressed their admiration of his achievement in no unstinted fashion. In 1926, he was invited to Harvard University, where he tempororily occupied the Chair of Surgery and, within the last few weeks, he was asked to occupy a similar position in St. Bartholomew's Hospital, London. He had hoped to spend a few weeks there in that capacity during the summer of 1929.

During the war he rendered most valuable service both overseas and at home. With the rank of Lieutenant-Colonel he was Surgeon-in-Chief in a Special Hospital at Ramsgate, England, and later exhibited splendid organizing ability in connection with similar work at the Christie Street Hospital, Toronto.

He was a Fellow of the American Surgical Society and Vice-President of that body at the time of his death. He was also a Past-President of the American Orthopaedic Association and an Associate member of the British Orthopaedic Association. McMaster University conferred on him the degree of LL.D. honoris causa.

He was a most popular colleague, beloved and respected by all his associates. He was born at Georgetown, Ontario, on July 1st, 1868. Surviving him are his wife and four daughters—one brother, who is in the medical profession, lives in Corning, N.Y., and a sister lives in Brooklin, Ont. To his widow and family we wish to convey our heartfelt sympathy.